Spectrum and Propagation Measurements

The radio spectrum is an enigmatic natural resource that offers immense benefit to industry, government, and private citizens by supporting radio/wireless communications and a wide variety of other systems like radar and remote sensing. It is non-depleting and exists everywhere, but it is finite and can be rendered less useful by noise and interference. Until recently, traditional methods of allocating spectrum and assigning channels have ensured effective and efficient use of the spectrum. Today, the rapidly expanding competition for spectrum use and the plethora of new signal types and applications have created an apparent shortage of radio spectrum. While new spectrum management methods will alleviate this problem, they cannot do so without increasingly more complex knowledge of the existing signals and noise environment and better understanding of how systems that share spectrum affect each other.

The Spectrum and Propagation Measurements Division provides the technical information needed to enable more effective and efficient use of the spectrum, thus enabling spectrum allocation and sharing regulations and policies that are effective, reliable, and enduring. To do so, the division performs analyses and measurements of the effects of radio signals on the spectrum and on other systems. Measurements and assessments of spectrum occupancy can be accomplished at any location using the mobile Radio Spectrum Measurement Science system. New measurement methods are developed and complex testing is accomplished in well-equipped laboratories and at the Table Mountain Field Site.

The following areas of emphasis are indicative of the work done in the Division recently in support of NTIA, other Federal Agencies, academia, and private industry.

Areas of Emphasis

Radio Spectrum Measurement Science (RSMS) Operations
The RSMS is comprised of laboratory, transportable, and mobile facilities. This capability is used to assess spectrum occupancy and usage, electromagnetic compatibility, and to resolve interference problems. This project is funded by NTIA.

RSMS-4 Development
Measurement methods, both established and new, are supported by hardware and software. They are continually being refined and developed. The fourth generation system software is capable of fully autonomous operation and remote monitoring, uniform data recording and storage, and powerful analysis and display routines. This project is funded by NTIA.

Table Mountain Research Program
This field site, protected by state law and federal regulation as a radio quiet zone, is used by many operations and experiments that require both protection from strong, external radio signals, and minimum vibration. Research into new spectrum occupancy measurement methods, including radio noise measurement, new antennas, and complex radar measurements are conducted by ITS at the site. These projects are funded by NTIA.

Spectrum Efficiency Research and Engineering
Investigations of the efficient and effective use of the radio spectrum, including allocation and assignment methods, are pursued. Definitions for spectrum efficiency and effectiveness can be nontrivial and elusive. Actual measurements of band and channel usage are compared with known assignments to determine the merits of new and competing channel assignment schemes. This project is funded by NTIA.

Signal Characteristics, Spectral Emissions, and Interference Analyses
A complex assessment of the interference potential of ultrawideband (UWB) signals was largely completed this past year. This study required the utmost care and thoroughness to determine which characteristics of a variety of UWB signals were best correlated with interference effects observed in a digital television satellite receiver. This project is funded by Freescale, Inc.